I-CAR® NEW ZEALAND

TECHNICAL REPORT

IN THE NAME OF AERODYNAMIC EFFICIENCY

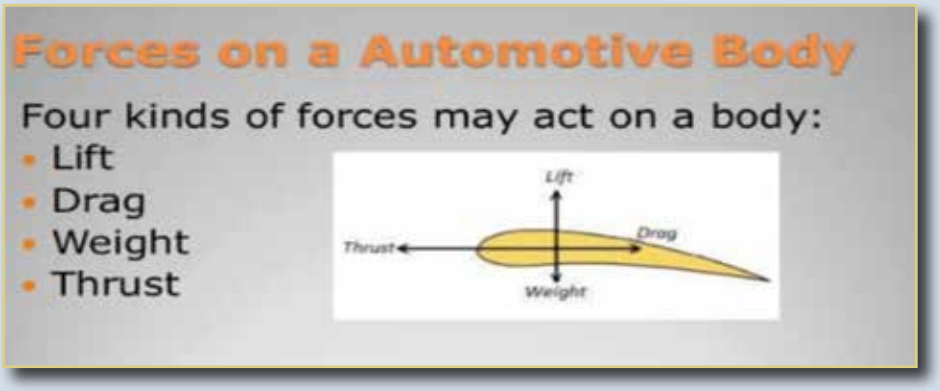
SO WHAT DOES AERODYNAMICS MEAN ?

This is the study (or dark art to many of us !), of moving gases - in this instance air, over a body in motion - and how that will effect that body's movement through the flow.

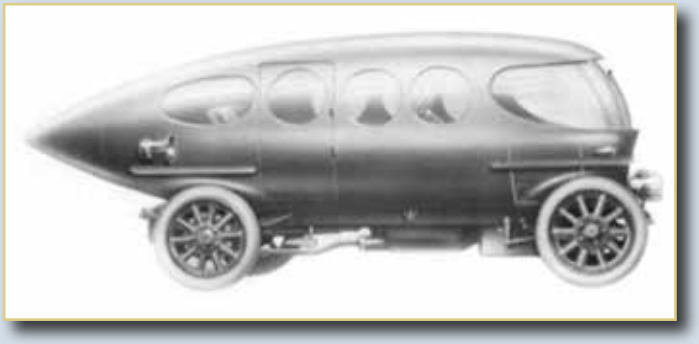
The best aerodynamic designs will make the vehicle more stable (especially at higher speeds), enhance Noise Vibration Harshness (NVH) qualities, improve performance, increase fuel efficiency and be aesthetically pleasing.

So - lots to think about there !!!

Aerodynamics 101 -



So, in the beginning :-



I-CAR NEW ZEALAND

TECHNICAL REPORT

IN THE NAME OF AERODYNAMIC EFFICIENCY

Then came :-

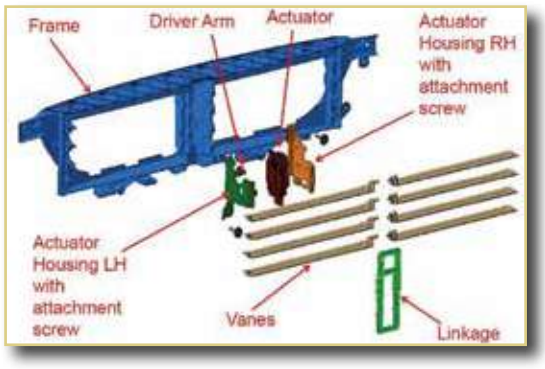
To today and tomorrow :-

One of the biggest innovations in everyday passenger vehicles being produced today is the advent of what are termed "Active Aerodynamics" - imaginative terminology for technical features that are able to change the aerodynamic profile(s) of a vehicle "on the fly".

Common examples of active aerodynamics are grille shutters, air curtains and adjustable ride height - These features are becoming increasingly common across a wide variety of vehicle body styles, from sedans, utilties to SUVs, and from various vehicle makers, such as General Motors, Ford, Chrysler, Subaru and BMW.

GRILLE SHUTTERS

2015 Dodge Ram 1500 Rebel active grille shutters



Located behind the radiator or bumper intake grille(s), the shutters are operated electronically by sensors that detect speed and heat - closing at higher speeds to "seal" off the front of the vehicle, increasing aerodynamic efficiency by enabling the vehicle to push through the air more efficiently.

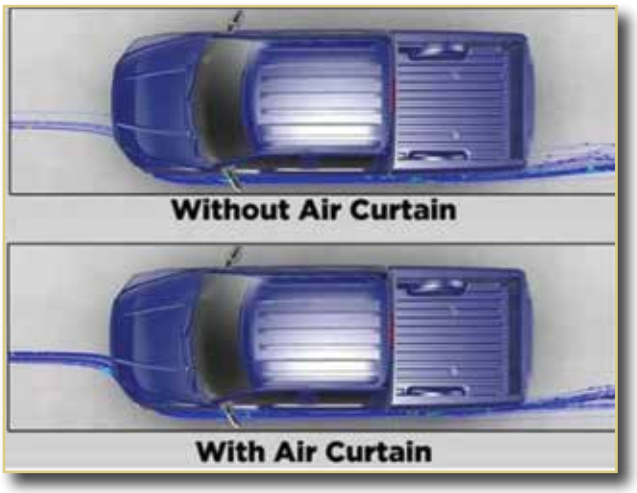
I-CAR® NEW ZEALAND

TECHNICAL REPORT

IN THE NAME OF AERODYNAMIC EFFICIENCY

AIR CURTAINS

These are vertical or horizontal slots or vents typically located on the outer corners of the front bumper face that channel air flow closer to the vehicle body, around the front wheels, minimizing drag and increasing fuel efficiency - an added benefit is realised by cool air being ducted over braking components etc, thereby reducing heat build up and component wear.



OTHER AERODYNAMIC FEATURES :-

AIR BREATHER

Wheel housings and wheels generate approximately 30% of the vehicle's entire aerodynamic drag.

The Air Breather is an air outlet behind the front wheeel that lowers turbulence in the wheel housings and breaks down the air swrls that form there.

It channels the air current on the front wheels and thus not only reduces the air flowing into the rear section of the wheel housings - but also the adverse effect of negative pressure on the side walls.

As a consequence, the aerodynamic drag is lowered while fuel consumption and CO2 emmissions and also effectively reduced.

I-CAR NEW ZEALAND

TECHNICAL REPORT

IN THE NAME OF AERODYNAMIC EFFICIENCY

UNDERBODY TRAYS, COWLS AND DIFFUSERS

It wasn't so long ago that you could look at the under carriage of a vehicle and clearly see all of the suspension components, exhaust system, X members and a myriad of brackets and fittings, as well as the back side of the bumper components and frames - Thats all changed in recent times - and not just for higher end vehicles.

We often have to scratch our heads when looking to jack up a late model vehicle and think carefully about where we can safely place the trolley jack and stands so as not to damage plastic trays and ducting.

Aerodynamic principles have come into play here also - a smooth underside promotes smooth, undisturbed air flow that reduces drag.

This type of aerodynamic enhancement can be done comparitively cheaply, as these components are typically made from inexpensive plastic materials.

Range Rover Evoque

AIR BLADE

The smaller the wake, the lower the level of turbulence created behind the rear. the air blade is a sharp-edged extension of the C pillar that seperates the air flow and thus reduces the wake behind the wheel.
The aerodynamic drag decreases - and with it so do both fuel consumption and CO2 emissions.

AERO WHEEL RIMS

The wheel housing on a vehicle plays a large role in the overall amount of drag experienced and the wheels themselves influence vehicle-specific drag due to the air turbulence they create.

Resistance-optimised Aero wheels in turbine wheel design reduce this effect by countering this turbulence effectively, channelling the air along the sides of the vehicle and reducing wind resistance. The result is lower consumption.